

Town of Lancaster, Massachusetts

Environmental Overlay District Pilot Project

5.0 Environmental Overlay Districts

Stormwater and wastewater can cause specific problems for the environment. Stormwater runoff warms rivers and streams, produces flashy flows and contributes stormwater pollutants, while reducing groundwater recharge and baseflow. Wastewater discharges from septic systems and treatment facilities can also be harmful to aquatic life, by adding excessive nutrients to water bodies. All of these things are unhealthy for aquatic life. As described earlier, environmental overlay districts may provide the needed protection for identified environmental resources by tailoring protection to the source of pollution and towards a better balance of water in the hydrologic cycle.

A multi-layered approach was taken for the environmental overlay districts in this project to promote a more natural water balance and protect resources from increased pollutants and warming. Three overlays were included, two of them new and one expanded, as follows:

1. Stormwater Overlay District. This new district could either be townwide or could just cover the North Lancaster area. It targets stormwater controls to increase recharge, reduce pollutants and channel erosion, and to provide cooler stormwater discharges.

2. Fisheries and Aquatic Habitat Overlay District (Fisheries Overlay). This new district protects fisheries and aquatic life as well as recreational water resources through two methods. First, the Fisheries Overlay targets large wastewater discharges with requirements for additional treatment to reduce nutrients. It also requires certain stormwater practices related to cooling of stormwater, namely underdrain filters. This district's boundaries cannot be defined by a map, but includes any lot containing bordering vegetated wetlands or their 100-foot buffer.

3. Expanded Water Resources Protection District. The existing Water Resources Protection Overlay is expanded to include high and medium yield aquifer areas not previously included, as well as their zone of contribution as defined by the contour divide. Figure 5-1 shows the Revised Water Resources District. In addition to some modifications of the existing performance standards, the new district will also require certain pathogen and nutrient controls on large flow wastewater systems (>1,000 gpd).

Each of the overlay districts is associated with specific performance standards controlling development impacts. Together, the overlay districts proposed herein would provide the following environmental benefits:

- 1) Pollutant removal – pollutants are carried by stormwater into lakes and streams, creating an unhealthy environment for aquatic life. These should be removed before stormwater is discharged.
- 2) Temperature control – warm stormwater flows and reduced groundwater baseflows increase stream temperatures, creating an unhealthy environment



Town of Lancaster, Massachusetts

Environmental Overlay District Pilot Project

for aquatic life. Temperatures should be controlled or sustained by minimizing the impacts to stream baseflows and through the use of infiltration and underdrain outlets that cool stormwater runoff.

- 3) Groundwater recharge – streams are drying up or becoming intermittent because rain water that once infiltrated the soils is now reaching the streams as stormwater runoff, reducing the quantity of groundwater that would have otherwise flowed to the streams as groundwater baseflow. Recharge is needed to more closely resemble a natural hydrologic cycle.
- 4) Sustainable aquifers – In addition to increasing the flows to streams, increased recharge will also provide more sustainable aquifers for water supply withdrawals.
- 5) Flood control – increased runoff rates and volumes create flooding problems which must be controlled to prevent damage to property and future infrastructure repair costs.
- 6) Channel protection – increased frequency of runoff rates and discharge volumes to streams increase stream-bed scouring and channel erosion, even during smaller storms, which destroy aquatic habitat. Control of runoff from smaller storms is necessary to prevent this.

5.1 Stormwater Performance Standards & Overlay District

The Massachusetts Department of Environmental Protection has an existing Stormwater Management Policy that outlines performance criteria and controls to increase recharge and address pollutants. However, this policy only applies to discharges within jurisdiction of the Wetlands Protection Act, leaving most uplands unprotected unless a town chooses to adopt this as a town-wide requirement. Additionally, although the policy does require some recharge, runoff is allowed to increase significantly in quantity and the controls on quality are limited. Past damages to recharge to improve existing streamflow conditions are not considered, and the policy does not address the damage associated with small, frequent storms, which have recently been identified as a major concern for stream channels.

To address these areas of limited benefit, the performance standards developed for this pilot project focus on increased recharge, while addressing pollutants, warming and flooding – all on a study area-wide or town-wide basis. Performance criteria were developed based on soil types (Figure 5-2) and groundwater levels (Figure 5-3). The performance criteria and overlay district apply to the entire study area, since the benefits are universally needed, and all stormwater discharges ultimately reach a surface water body, no matter where the development occurs. More infiltration and recharge is promoted in more permeable soils and less for tighter soils, not so much to compensate for existing development, but to accommodate the potential increased runoff generated



Town of Lancaster, Massachusetts

Environmental Overlay District Pilot Project

when the forest cover is lost and evapotranspiration is converted to runoff. Groundwater levels also dictate the type of stormwater treatment that can be provided. The following is a summary of the performance criteria:

- A Recharge is required for groundwater depths greater than four feet at the quantities provided in the table below.

Performance Criteria	
Soil Type	Recharge Over Impervious Surface (inches)
A	1.25
B	1.00
C	0.65
D	0.10

- B A water quality volume (WQV) of 1" over the impervious surface must be treated to remove pollutants before being discharged to surface waters. Acceptable treatment methods include:
- 1 Infiltration at a rate not to exceed 2.5 inches/hour
 - 2 Bioretention with infiltration or an underdrained outlet structure
 - 3 Wet pond with underdrained outlet
 - 4 In all cases, the stormwater water quality volume must be treated through either infiltration or an underdrain discharge system that allows the water to cool before being discharged. An underdrain system works by forcing the stormwater through a soil filter located above a gravel-packed drain and allowing for slow release of the water. The cool soils and gravel help to cool the water before it is discharged.
- C Post-development peak flows can not exceed pre-development peak flows for the 2-, 10- and 25-year, 24-hour storms. This will provide flood control for the larger storms.
- D 24-hour extended detention of the 1-year, 24-hour storm must be provided. This reduces channel erosion in streams from the more frequent storms. This is not required for direct discharges to a lake, estuary or 4th order stream. However, the recharge and water quality treatment requirements outlined above will still be required for these discharges.
- E Steep slope considerations for slopes over 25% (see Appendix A).

Refer to the Logic Chart on Figure 5-4 for an overview of the stormwater performance criteria and how they apply.

5.2 Wastewater Performance Standards & Overlay Districts

The Integrated Water Resources Management Plan (IWRM) being prepared by Lancaster concurrently with this study considers wastewater facilities planning with a greater than



Town of Lancaster, Massachusetts

Environmental Overlay District Pilot Project

normal consideration of innovative and alternative systems and options. It also considers water supply and stormwater impacts from sewerage and weaves these three major aspects of the Town's services together to provide a more cost-effective solution to encouraging appropriate economic growth while providing a viable alternative to sprawl.

The expanded Water Resources District and the Fisheries Overlay take into account that the alternatives chosen by the Town to provide for wastewater treatment are not yet known (for North Lancaster) and may include continued Title 5 systems in some areas, decentralized wastewater treatment systems or large flow systems in some areas and central waste treatment for some areas.

From a water balance perspective, individual onsite systems may provide the best solution, but they may also lead to sprawl and may not be feasible in some areas due to soils constraints. This may lead to the greater use of decentralized wastewater treatment systems or large flow systems (>1,000 gallons per day or gpd) that fall between centralized treatment and individual systems.¹ Due to their size, these systems do have greater potential to pollute nearby water resources or aquifers if not designed or sited correctly. On the other hand, these may be suitable for providing 'villages' with wastewater treatment at a considerably reduced cost from centralized treatment. Similar to individual onsite systems, they may also help keep the water within the area it was taken from, helping to maintain the water balance, whereas centralized systems may send it to an offsite location. These treatment systems may be combined with alternative collection systems such as grinder pumps to pressure collection systems or septic tank effluent gravity or pressure collection (STEG or STEP) systems. Each has potential for greater problems such as large sludge quantities or considerable septage management, but they may also provide considerable savings over gravity sewers which typically only become cost-effective with more than 100 houses per mile with business and industrial base and where distance to the main sewer line is within five miles. However, the water balance should also be considered when weighing options, as sewerage could result in off-site flows, disrupting the water balance.

Boosting the treatment effectiveness of large flow systems is the aim of the revisions to the Water Resources Protection District and Fisheries Overlay Districts. In these overlays, nutrient and pathogen reduction technologies will be favored over less effective techniques, and the 'treatment trains' may include additional steps that will protect local aquifers from pathogens and nitrate pollution, and protect aquatic life from nutrient pollution. These will be done through the following performance goals:

¹ Title 5 covers up to 10,000 gpd systems, while CMR 314 covers systems 10,000 gpd and over. This performance standard uses 1,000 gpd as a supplemental threshold for additional treatment requirements since these large flow systems may be more likely to cause environmental damage or pollute aquifers. These are also more likely to handle commercial or industrial development or multiple residences in the North Lancaster area, and are more likely to occur in areas that remain unsewered by central systems.

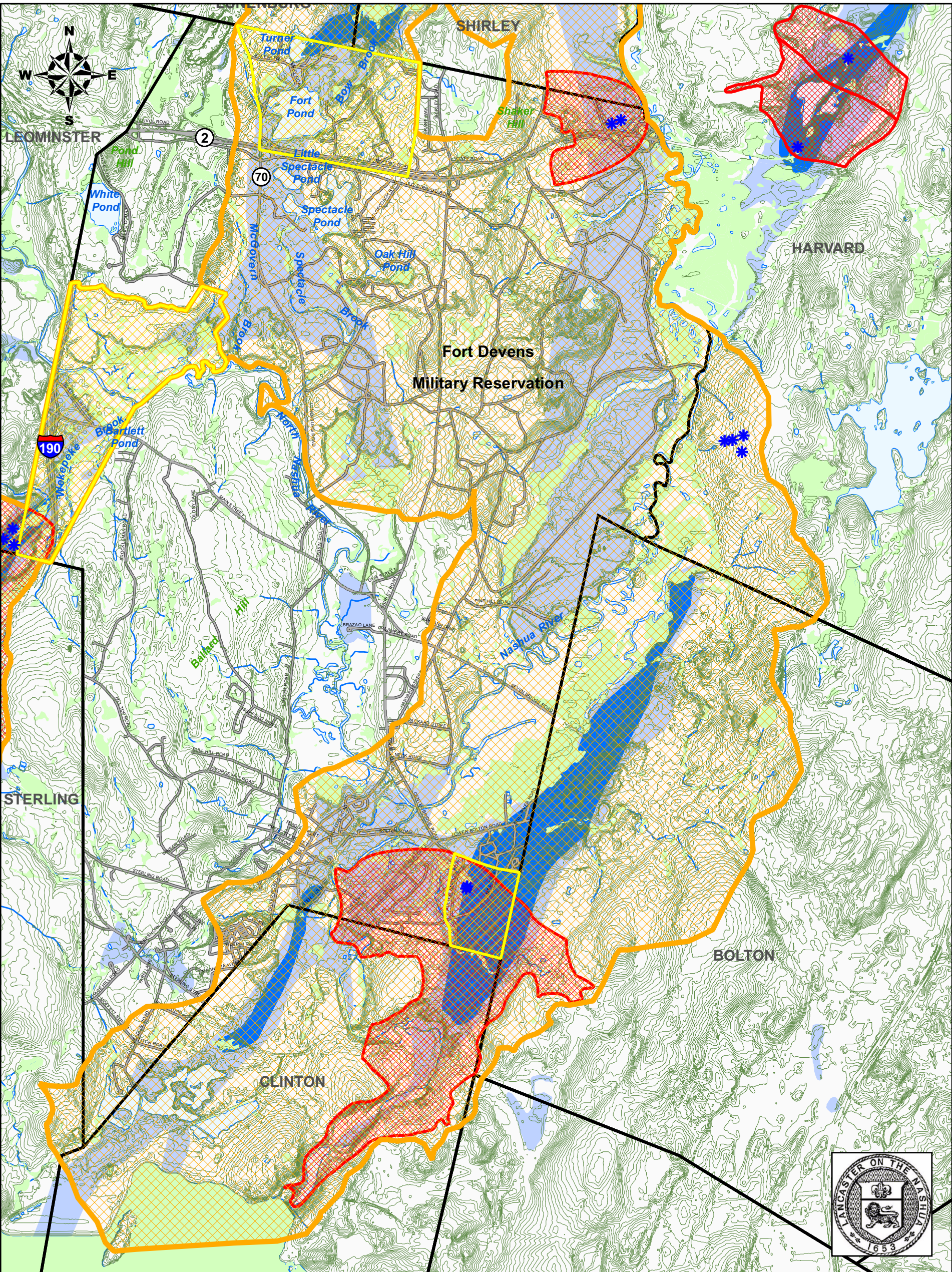


Town of Lancaster, Massachusetts Environmental Overlay District Pilot Project

- Large flow wastewater treatment systems (>1,000 gpd) in the revised **Water Resources Protection District** must meet 10 mg/L nitrate at the property boundary or limit of sensitive resource and must include pathogen treatment. Medical offices, veterinary hospitals and nursing homes that have the potential for high pathogen pollution from either large flow or individual systems must also include pathogen controls, for example, recirculating filters, use of alternate fields, or the addition of ultraviolet disinfection in some cases.²
- Large flow wastewater treatment systems (>1,000 gpd) in the **Fisheries Overlay** (which matches the jurisdiction of the Wetlands Act) must also meet 10 mg/L nitrate at the property boundary or limit of sensitive resource, which may require the use of nutrient reduction technologies such as recirculating filters that provide aerobic/anaerobic steps for nitrification/denitrification to minimize any impacts on aquatic life or recreational resources.

² The Integrated Water Resources Management Plan describes technologies and their appropriate use in further detail.





LEGEND

- | | |
|---------------------------------------------|--------------------|
| Public Water Supply | Hydrography |
| Existing Water Resource Protection District | Lake, Pond |
| Revised Water Resource Protection District | DEP Wetlands |
| MADEP ZONE II | Stream, Brook |
| Aquifer Yield (Gallons per Minute) | Elevation Contour |
| 100-300 | Town Boundary |
| >300 | |

Data Sources: Town of Lancaster, MassGIS, MADEP, CEI

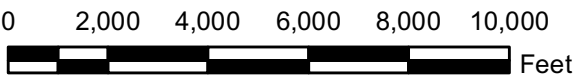


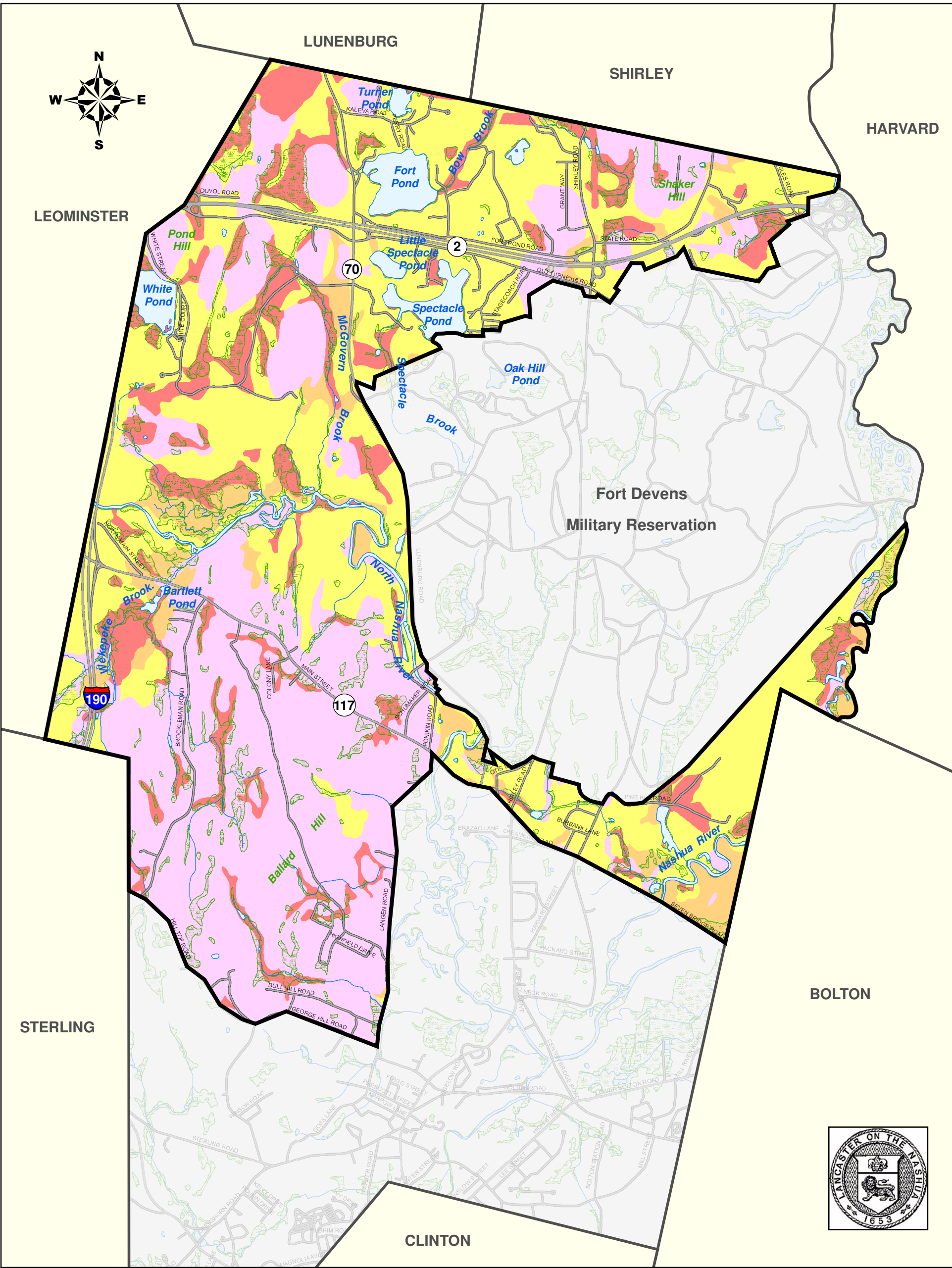
Figure 5-1

**Revised
Water Resource Protection District**

Lancaster, MA



Comprehensive Environmental Inc.



LEGEND

Soils - Hydrologic Group

- A (High Permeability)
- B
- C
- D (Low Permeability)

Hydrography

- Lake, Pond
- DEP wetlands
- Stream, Brook
- IWRM Study Area

Data Sources: Town of Lancaster, MassGIS, MADEP, USGS


02,0004,0006,0008,00010,000

Feet

Figure 5-2

Soils Hydrologic Classification

Lancaster, MA



Comprehensive Environmental Inc.

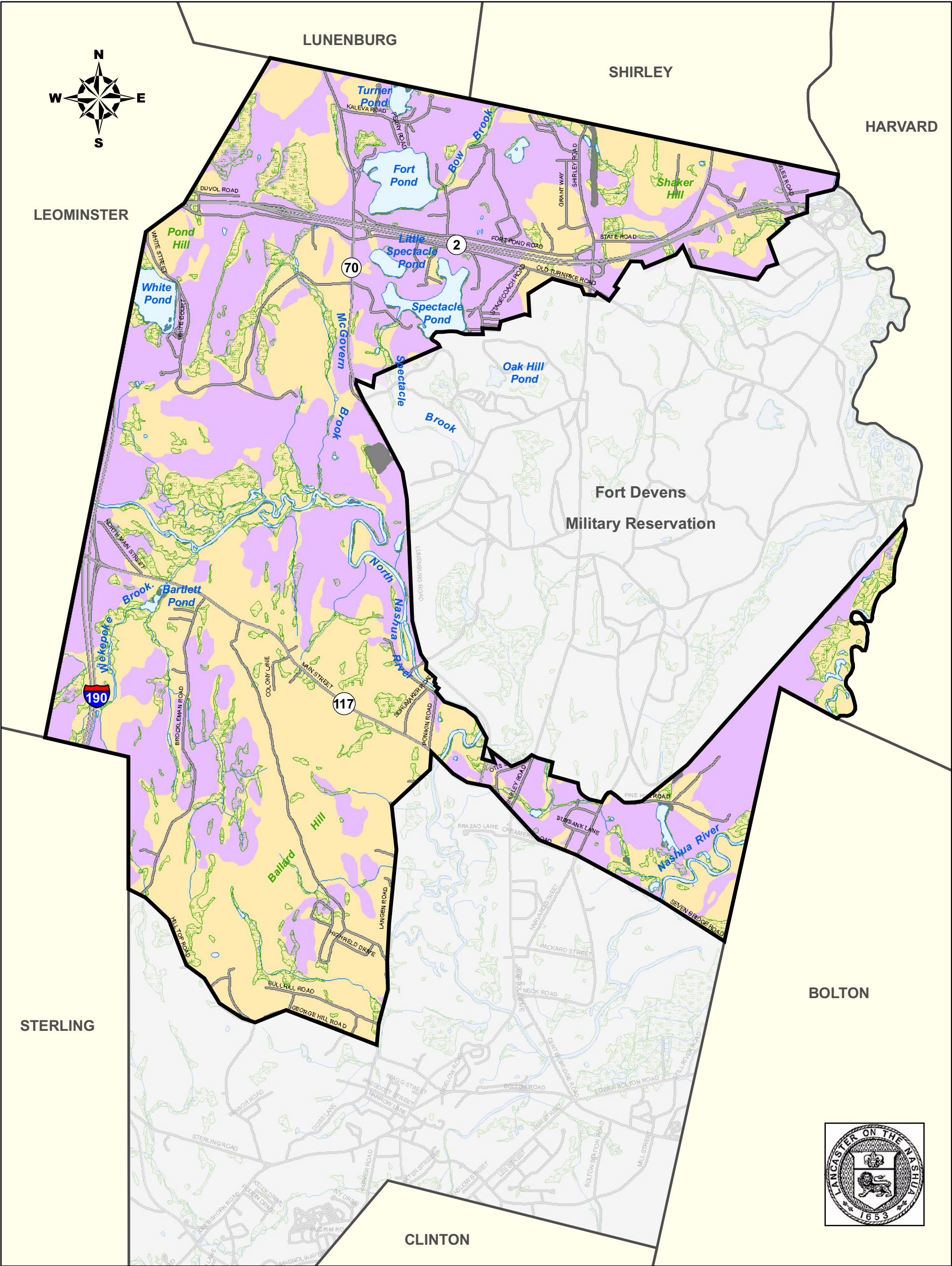


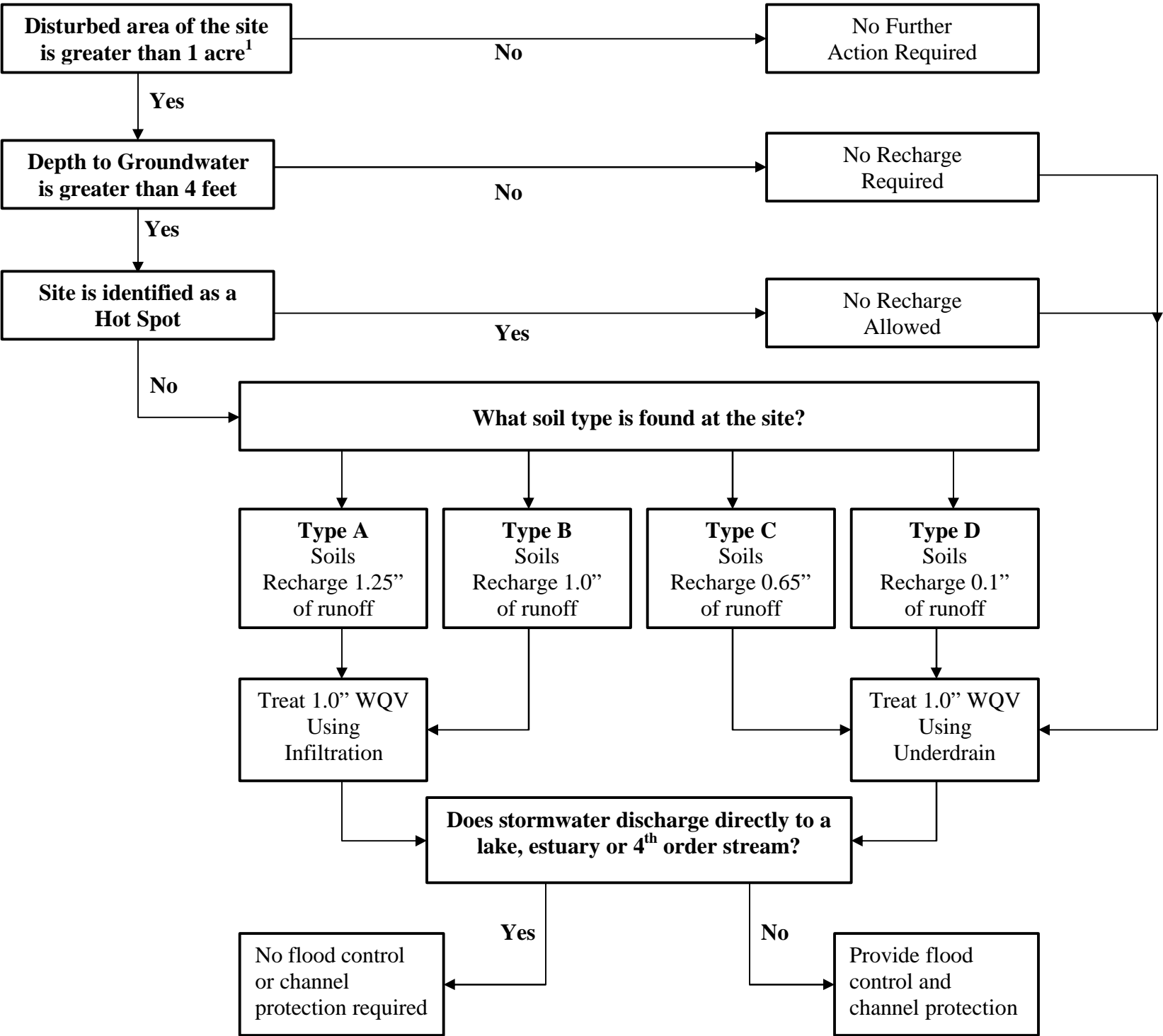
Figure 5-3

Soils
Depth to Groundwater
Lancaster, MA



Comprehensive Environmental Inc.

Figure 5-4
Performance Criteria Logic Chart



DEFINITIONS

WQV – Water Quality Volume. This must be treated to remove sediments, nutrients, hydrocarbons, metals and pathogens associated with stormwater runoff.

Infiltration – Primary focus is to treat stormwater runoff, with a secondary benefit of recharging the groundwater. It requires a maximum infiltration rate to allow for adequate pollutant removal.

Recharge – Primary focus is to replenish groundwater. It does not necessarily treat the water and does not have a restriction as to the maximum recharge rate. For example, in Type A soils, only 1” of the recharge volume requires treatment, and the remaining 0.25” can be recharged without treatment.

Channel Protection – Must be provided through 24-hour extended detention of the 1-year, 24-hour storm. This can be provided through water quality BMPs and detention structures for flood control.

Flood Control – Post development peak flows can not exceed Pre development peak flows for the 2-year, 10-year and 25-year, 24-hour storms.

Hot Spot – Hot Spots are defined as:

1. Stormwater discharges associated with Standard Industrial Classifications [NPDES stormwater permit program requirements apply]
2. Auto salvage yards (auto recycler facilities)
3. Auto fueling facilities (gas stations)
4. Fleet storage areas (cars, buses, trucks, public works)
5. Vehicle service, maintenance and equipment cleaning areas
6. Road salt storage and loading areas (if exposed to rainfall)
7. Commercial nurseries
8. Flat metal (galvanized metal or copper) rooftops of industrial facilities
9. Outdoor storage and loading/unloading areas of hazardous substances
10. SARA 312 generators (if materials/containers exposed to rainfall)
11. Marinas (service, repainting and hull maintenance areas)

Notes:

¹A 1-acre of disturbed area threshold was chosen for the site to be consistent with EPA’s Phase II Stormwater Management Program requirements.

